

# TEACHING for the TWENTY-FIRST CENTURY

Graded Course of Study for Science

Archdiocese of Cincinnati

2009

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## **PROGRAM PHILOSOPHY**

In science, children make discoveries about their environment and themselves. It is crucial to science education that students at every level have the opportunities to participate in hands-on activities, and to investigate, make hypotheses, test ideas, and draw conclusions.

Because science deals with phenomena and objects that are part of a child's daily life, it is a subject that engenders enthusiasm in the student. By building on a curiosity about the world and how it works, science classes can help students develop skills in gathering, categorizing, quantifying, and interpreting information. A good science program will also help students make realistic and informed decisions about their health, and about issues and careers in science and technology in the 21st century.

In a Catholic school, students of science will marvel at the beauty of God's creation and be strengthened in their faith because of it. They will also learn that, as individuals created by God, they must take care of their own bodies, and also take responsibility for protecting their immediate environment, the planet Earth, and that part of space affected by humankind.

## **PROGRAM GOALS**

### **GOAL I: ATTITUDES AND SKILLS OF SCIENTIFIC INQUIRY**

#### **Program Objective A:**

Students will develop a positive attitude toward creation in general and science in particular

#### **Program Objective B:**

Students will develop skills needed for scientific inquiry

### **GOAL II: KNOWLEDGE OF SCIENCE AND HEALTH**

#### **Program Objective A:**

Students will develop an understanding of the various areas of science:

#### **Earth /Space Science:**

- Astronomy
- Meteorology
- Geology
- Oceanography

#### **Life Science:**

- The cell
- The organism
- Populations of organisms
- Natural systems
- Environmental issues

#### **Physical Science:**

- Chemistry
- Physics

#### **Program Objective B:**

Students will develop knowledge and skills contributing to health and safety.

## What's New?

The intent of this revision is to make the teaching of science at all grade levels more meaningful through **fewer objectives**, allowing the teacher more time to develop the ones listed, and providing time to do activities and investigations to bring the concepts into sharper perspective.

In this revision we have:

- Reduced the **number of objectives** to be covered
- Incorporated **attitudes and skills** of scientific inquiry into objectives
- Added free, live **website links** to science sources that support the various objectives
- Required some **hands-on activities** at every grade level
- Identified previously taught objectives at upper grade levels (**For Review**) to help focus attention on new material (**For Development**)
- Added **Society and Technology** objectives in keeping with state standards

For your convenience, we have included **optional lesson planning pages** listing **truncated** objectives. These should be a help in keeping the various objectives in mind during planning, and in incorporating more than one objective in a lesson. Please remember, however, that the objectives on the lesson planning page may be “trimmed” to fit the confined space, and the **actual objective in the GCS** may have more clarity, and will have the web links as well.

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## How to Use This Graded Course of Study

This document is given to you electronically so that you can access the [grade level objectives](#) and resource links that accompany the objectives in every section/grade level. The **resource links** include teacher lesson plans, blackline masters, reproducible activities and experiments, and online interactive activities and quizzes. All resources linked in this document are free to teachers. Other resources are available to schools for subscription fees.

Teachers may find it most helpful to print out the grade level objectives, or utilize the grade level **lesson planning sheets** in the appendix as reminders of the content to be covered. The [Levels of Mastery](#) should act as a guide in assessing whether the material has been adequately covered at the assigned level.

The State of Ohio requires that **Health** be taught in grades K-6. These objectives, though, may be shared among science, physical education, and religion teachers. One final, separate grade for Health needs to be recorded for the year.

The **Environmental Focus** and **Life Focus** at each grade level is meant to familiarize students with various environmental issues and animal species. These focal points should be introduced early in the school year, and incorporated into the lessons and activities whenever possible. They could be the focus of current events or a major school activity, but should be continually referenced throughout the year.

[Appendices](#) and supporting documents are bookmarked throughout this document for easy navigation.

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## Levels of Mastery

This revision has been developed with the goal of designing a document that would outline developmentally-appropriate material for each grade level and to limit the amount of material to what could realistically be expected to be covered within the school year. These goals, obviously, will vary with the ability of the class and the expertise of the teacher, but hopefully teachers will find that the science objectives are “do-able” during the course of the school year. With that in mind, the **objectives written for a specific grade level should be introduced, developed, and at least partially mastered at the grade level for which they are written.**

It should be noted, too, that **the main purpose of studying science is for students to gain an understanding of “how things work,”** of why things in the physical world act and react as they do. Vocabulary is important in so far as it aids understanding, but memorizing definitions is far less important than understanding concepts.

**Objectives at all grade levels should be introduced and developed.** That is, the concepts should be presented to the students in a motivating way, encouraging them to want to understand more about how the concept affects their world, their lives. Developing a concept or objective includes providing students with learning experiences that expand, enlarge, and concretize their understanding. Teachers developing material would use a variety of strategies to investigate, practice, and reinforce the idea, skill or objective, and to relate it to real world issues and applications. During development of a topic, the “lightbulb,” or “aha!” effect (understanding) should occur for most students.

**Mastery** occurs when a student has a clear understanding of the material and can demonstrate or apply it to new materials or situations. For many students this will occur to at least a limited degree during the grade level in which the objectives are covered. As students mature, they will refine their learning in light of their growth in understanding. A solid foundation in developing basic concepts will serve students well as they continue their study of science through high school.

**Assessing students’ understanding**, therefore, is important. Paper/pencil tests, especially those focused on science definitions, may provide little opportunity for students to demonstrate or express how well they actually understand the material covered. Teachers are encouraged to explore alternative means of assessing student progress in understanding. Some alternative methods of assessment are suggested in this document, but these suggestions should not be viewed as comprehensive. Demonstrating how a concept works, or applying it to a situation, generally indicates a better grasp of the material.

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## Pre-Kindergarten

Students in Pre-K will:

### Environmental Focus

1. Treat the earth with respect by reducing **littering**
2. Respect the earth's resources by **conserving water** at drinking fountains, restrooms
3. Discuss why we need to stop littering and save water

Resources: [Kids Ecology Corps](#), [Keep Cincinnati Beautiful](#), [Keep America Beautiful](#)

### Life Science

4. **Activity:** Classify/sort **living and non-living** organisms
5. Identify the common parts of plants (**leaves, roots, stem or stalk, flower**)
6. Classify members of the animal kingdom by body coverings (**fur, feathers, and scales**)
7. Recognize that most **offspring** look similar to their parents

Resources: [Living vs. non-living Quiz](#), [Flower coloring pages](#), [Plant and Garden activities](#)

### Health/Human Body

8. Cover mouth when coughing, sneezing
9. Explain why we should wash our hands often
10. **Activity:** Identify general **body parts** (head, shoulders, arms, legs, foot, elbow, etc.)
11. Identify situations when the **9-1-1** emergency number should be called
12. **Activity:** Role play a 9-1-1 emergency call
13. Recognize certain lures that may lead to molestation and/or abduction

Resources: [Kid's Health](#), [Safety Kids](#), [McGruff](#) (formerly FBI) website

### Earth / Physical Science

14. Demonstrate how the **sun** and shadows are related
15. Explain that night is the absence of sun
16. Identify dawn, daylight, twilight or dusk
17. Describe **safety** precautions to take in various storm situations

Resources: [Kids Science News Network](#) (NASA), [day and night](#)

### Society and Technology

18. **Activity:** Sort/identify objects as **natural or man-made**
19. Identify the purpose for specific **tools** (e.g. scissors, fork, shovel)
20. Identify tools needed for certain projects (e.g. to build a birdhouse, bake a cake)
21. Explain how tools make work easier

Resources: [Living vs. non-living Quiz](#), [online activity](#)

**Related Readings**

Nonfiction books about shadows, the sun, safety, animal babies, and plants

**Informal Assessment**

Pre-K objectives may be assessed through student discussion, drawings, oral explanations, sorting activities, or responses to “What would happen if . . . ?” questions. Many of the objectives can be presented in learning centers.

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Date \_\_\_\_\_

Class \_\_\_\_\_

<b>Teacher Materials:</b>		<b>Student Materials:</b>	<b>Announcements:</b>
<p style="text-align: center;"><b>Pre-Kindergarten Science Objectives</b> <b>Archdiocese of Cincinnati</b></p>		<b>Instructional Objectives:</b>	
<p><b><u>Environmental Focus</u></b></p> <ol style="list-style-type: none"> <li>1. Treat the earth with respect by reducing <b>littering</b></li> <li>2. Respect the earth's resources by <b>conserving water</b> at drinking fountains, restrooms</li> <li>3. Discuss why we need to stop littering and save water</li> </ol> <p><b><u>Life Science</u></b></p> <ol style="list-style-type: none"> <li>4. <b>Activity:</b> Classify/sort <b>living and non-living</b> organisms</li> <li>5. Identify the common parts of plants (<b>leaves, roots, stem or stalk, flower</b>)</li> <li>6. Classify members of the animal kingdom by body coverings (<b>fur, feathers, and scales</b>)</li> <li>7. Recognize that most <b>offspring</b> look similar to their parents</li> </ol> <p><b><u>Health/Human Body</u></b></p> <ol style="list-style-type: none"> <li>8. Cover mouth when coughing, sneezing</li> <li>9. Explain why we should wash our hands often</li> <li>10. <b>Activity:</b> Identify general <b>body parts</b> (head, shoulders, arms, legs, foot, elbow, etc.)</li> <li>11. Identify situations when the 9-1-1- emergency number should be called</li> <li>12. Role play a 9-1-1 emergency call</li> <li>13. Recognize certain lures that may lead to molestation and/or abduction</li> </ol>	<p><b><u>Earth / Physical Science</u></b></p> <ol style="list-style-type: none"> <li>14. Demonstrate how the <b>sun</b> and shadows are related</li> <li>15. Recognize that night is the absence of sun</li> <li>16. Identify dawn, daylight, twilight or dusk</li> <li>17. Describe <b>safety</b> precautions to take in various storm situations</li> </ol> <p><b><u>Society and Technology</u></b></p> <ol style="list-style-type: none"> <li>18. <b>Activity:</b> Sort/identify objects as natural or man-made</li> <li>19. Identify the purpose for specific tools (e.g. scissors, fork, shovel)</li> <li>20. Identify tools needed for certain projects (e.g. to build a birdhouse, bake a cake)</li> <li>21. Understand that tools make work easier</li> </ol>	<b>Procedure:</b>	
<b>Homework:</b>		<b>Evaluation:</b>	



## Kindergarten

Includes the Pre-K objectives if these were not covered, and adds the following:

Students in Kindergarten will:

### Environmental Focus

1. Explain why it is important to **conserve** water and energy (as in lights, showers)
2. List all the ways water helps people
3. Describe several **ways to conserve** water, energy

Resources: [Kids Ecology Corps.](#), [Planet Pals](#), [Planet Protectors Club](#)

### Life Science

4. Identify the needs of living organisms (**oxygen, nutrients, water**)
5. **Classify or group** plants and/or animals on the basis of common characteristics
6. Discuss how animal families share **common characteristics**, but can vary greatly (study different kinds of dogs, cats, fish, etc. )
7. Identify the **external** structures of an organism which enables it to live, move, and obtain food
8. **Activity:** Match the natural **habitats** of various organisms (fish, birds, animals, etc.)

Resources: [Needs of living things](#), [Classifying](#), [Lesson on living things](#), [Needs in pics](#), [Life cycle 1](#), [Life cycle 2](#), [Habitat game](#), [Lesson from Kennedy Center](#)

### Health/Human Body

9. Demonstrate **good posture** and tells why it is important
10. Describe the structure and function of each of the five special **sensory organs**
11. List some ways to prevent **tooth decay**
12. List safety precautions for protecting the **eyes**
13. List things to avoid as dangerous to the **ears**
14. Identify the **general area** of the following organs: heart, lungs, brain, stomach
15. Identify **body parts**
16. Identify causes and list means of **preventing accidents** in the home, including fire
17. Describe effective responses to **fire emergencies** (home, school, outdoors, public places)
18. Identify situations when the **9-1-1- emergency** number should be called
19. Role play a **9-1-1 emergency call**
20. Recognize certain lures that may lead to molestation and/or abduction

Resources: [Kid's Health](#), [Safety Kids](#), [McGruff](#) (formerly FBI website), [Body parts](#)

### Earth / Physical Science

21. Observe and record the main characteristics of the **seasons** of the year
22. **Activity:** Record **daily weather** conditions at specified times
23. Explain (simply) what causes **night and day**
24. Describe the main characteristics of the various types of **precipitation** (rain, snow, ice)
25. Demonstrate that some objects **float** and others **sink** in water
26. Distinguish between **magnetic** and nonmagnetic objects

Resources: [Weather coloring books](#), [Magnets](#)

## **Society and Technology**

- 27. Answer “what would happen if” questions (e.g. if it didn’t rain for a year)
- 28. Use as many senses as possible to describe an object or to observe something in nature
- 29. Discuss why some materials are better suited to a purpose than others (e.g. houses of *The Three Little Pigs*; would you make a car out of paper? etc.)

**Resources:** [Senses](#), [Fruits and Vegetables](#) (sensing)

**Related Readings:** Nonfiction books related to weather, visits to doctors, dentists, etc.; animal coverings, human body parts; dogs; night and day

**Informal Assessment:** See Pre-Kindergarten

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Date \_\_\_\_\_

Class \_\_\_\_\_

<b>Teacher Materials:</b>		<b>Student Materials:</b>	
<p align="center"><b>Kindergarten Science Objectives</b> <b>Archdiocese of Cincinnati</b></p> <p><b>Includes the Pre-K objectives</b></p> <p><u><b>Environmental Focus</b></u></p> <ol style="list-style-type: none"> <li>1. Explain why it is important to <b>conserve</b> water and energy (as in lights, showers)</li> <li>2. List all the ways water helps people</li> <li>3. Describe several <b>ways to conserve</b> water, energy</li> </ol> <p><u><b>Life Science</b></u></p> <ol style="list-style-type: none"> <li>4. Identify the needs of living organisms (<b>oxygen, nutrients, water</b>)</li> <li>5. <b>Classify or group</b> plants and/or animals on the basis of common characteristics</li> <li>6. Discuss how animal families share common characteristics, but can vary greatly (study different kinds of dogs)</li> <li>7. Identify the <b>external</b> structures of an organism which enables it to live, move, and obtain food</li> <li>8. <b>Activity:</b> Match the natural <b>habitats</b> of various organisms (fish, birds, animals, etc.)</li> </ol> <p><u><b>Health/Human Body</b></u></p> <ol style="list-style-type: none"> <li>9. Demonstrate <b>good posture</b> and tells why it is important</li> <li>10. Describe the structure and function of each of the five special <b>sensory organs</b></li> <li>11. List some ways to prevent <b>tooth decay</b></li> <li>12. List safety precautions for protecting the <b>eyes</b></li> <li>13. List things to avoid as dangerous to the <b>ears</b></li> <li>14. Identify the <b>general area</b> of the following organs: heart, lungs, brain, stomach</li> <li>15. Identify <b>body parts</b></li> <li>16. Identify causes and List means of <b>preventing accidents</b> in the home, including fire</li> <li>17. Describe effective responses to <b>fire emergencies</b> (home, school, outdoors, public places)</li> <li>18. Identify situations when the <b>9-1-1-emergency</b> number should be called</li> <li>19. Role play a <b>9-1-1 emergency call</b></li> <li>20. Recognize certain lures that may lead to molestation and/or abduction</li> </ol>		<p><b>Instructional Objectives:</b></p> <p><u><b>Earth / Physical Science</b></u></p> <ol style="list-style-type: none"> <li>21. Observe and record the main characteristics of the <b>seasons</b> of the year</li> <li>22. <b>Activity:</b> Record <b>daily weather</b> conditions at specified times</li> <li>23. Explain(simply) what causes <b>night and day</b></li> <li>24. Describe the main characteristics of the various types of <b>precipitation</b> (rain, snow, ice)</li> <li>25. Demonstrate that some objects <b>float</b> and others <b>sink</b> in water</li> <li>26. Distinguish between <b>magnetic</b> and nonmagnetic objects</li> </ol> <p><u><b>Society and Technology</b></u></p> <ol style="list-style-type: none"> <li>27. Answer “what would happen if” questions (e.g. if it didn’t rain for a year)</li> <li>28. Use as many senses as possible to describe an object or to observe something in nature</li> <li>29. Discuss why some materials are better suited to a purpose than others</li> </ol>	
		<b>Procedure:</b>	
		<b>Announcements:</b>	
<b>Homework:</b>		<b>Evaluation:</b>	

## Grade 1

Students in Grade 1 will:

### Environmental Focus

1. Discuss how to treat earth with respect and appreciate the beauty of the earth
2. Study the causes and effects of **littering**
3. Notice and appreciate environments (streets, highways, yards) that are litter-free
4. Take steps to prevent, reduce littering

**Resources:** [Keep Cincinnati Beautiful](#), [Montgomery Co. Solid Waste District](#), [Planet Pals](#), [Planet Protector Club](#) , [Edible landfill](#), [Rumpke virtual tour](#) , [Make your own paper](#)

### Life Science (focus on birds)

5. Study birds: Where do birds live? What do they eat? How do they move? Place a bird feeder where students can view it if possible. Identify common birds. Understand the role birds play in nature.
6. Identify the **common parts of plants**
7. List what a plant needs **to survive** (food/light, water, oxygen)
8. **Activity:** Grow **plants** from seed
  - a. Measure and record plant growth
  - b. Vary the amount of water and sunlight given to some plants
  - c. Observe and collect data on plant growth
  - d. Compare data with that of other students
9. **Activity:** Draw ways in which **seeds** can be dispersed
10. Explain that land, air, water, and space make up the **environment**
11. Identify external **structures** of animals which enable them to move and to obtain food
12. Identify materials used by animals to **build their homes** in various habitats
13. List ways in which various animals **adapt** for survival
14. Describe the **life cycle** of animals
15. Identify basic aspects of the **food chain** (who eats what)
16. Identify **similarities/differences** between plants and animals

**Resources:** [Animal/plant needs](#), [Bill Schmoker](#) bird photos or [Bird Picture](#) display list, Good bird facts ([superlatives](#)) on this PBS site. [DLTK](#) has a great site for bird activities for children! [Birds](#) (National Geographic)

**Plants:** [Growing plants simulation](#), [ProTeacher Archive I](#) and [II](#), [Inside a Seed](#), [Quick and Easy Activities](#), [Plants](#), [Flower Sequence cards](#)

**Habitats:** [Everybody Needs a Home](#), [Where Plants and Animals Live](#), [Plants/animals and environment](#)

### Health/Human Body

17. Identify the five **senses** and the function of each
18. Identify the general location of the **heart, lungs, brain, stomach**
19. Describe the **primary functions** of the heart, lungs, brain, stomach
20. Explain the primary function of **bones and muscles**
21. Identify ways **diseases** are spread
22. Explain why we should wash our hands often
23. Describe why **food** is needed for growth and development
24. Tell why **water, sleep, and exercise** are important for good health

25. Recognize certain **lures** that may lead to molestation and/or abduction

**Resources:** [Five Senses lesson](#), [Classifying the Five Senses](#), [Body Organs Riddles and Puzzles](#), [Glitter Germs](#), [Health \(#23/24\)](#), [Nutrition Unit](#), [Strangers](#)

### Earth/Physical

26. Name the **seasons** of the year and their main characteristics

27. Explain how **seasonal** and **weather changes** affect plants, animals

28. **Activity:** Read a weather thermometer (Fahrenheit)

29. **Activity:** Record **daily weather** conditions and temperatures at specified times

30. Describe the main characteristics of the various types of **precipitation** (rain, snow, ice)

31. Describe **safety** precautions to take in various storm situations

32. Identify the three **forms** that water can exhibit

33. Explain that pushing and pulling are two forms of **force**

34. Explain that objects fall or roll downhill because of **gravity**

35. **Activity:** Explore ways of making an object **change direction, speed**

**Resources:** [Weather safety](#), [Weather Coloring Books](#), [Make a thermometer](#), [Reading a thermometer](#), [Push and pull 1](#), [Push and pull 2](#) (includes worksheets)

### Society and Technology

36. Use appropriate tools to **gather data** (thermometer, rain gauge)

37. Identify ways ordinary people **use science** (weather, transportation, communication, etc.)

**Resources:** [weather tools](#)

### **Related Readings**

DK Eye Know books, general books about plants, the five senses, weather, animals and their homes

### **Informal Assessment**

Student-made booklets, student observation notes, building habitats (terrarium, etc.) and similar activities.

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Date \_\_\_\_\_

Class \_\_\_\_\_

Teacher Materials:	Student Materials:
<p style="text-align: center;"><b>Grade 1 Science Objectives</b> <b>Archdiocese of Cincinnati</b></p> <div> <div> <p><b><u>Environmental Focus</u></b></p> <ol style="list-style-type: none"> <li>Discuss how to treat earth with respect and appreciate the beauty of the earth</li> <li>Study the causes and effects of <b>littering</b></li> <li>Notice environments (streets, highways, yards) that are litter-free</li> <li>Take steps to prevent, reduce littering</li> </ol> <p><b><u>Life Science (focus on birds)</u></b></p> <ol style="list-style-type: none"> <li>Study birds: Where do birds live? What do they eat? How do they move? Place a bird feeder where students can view it if possible. Identify common birds. Understand the role birds play in nature.</li> <li>Identify the <b>common parts of plants</b></li> <li>List what a plant needs <b>to survive</b> (food/light, water, oxygen)</li> <li><b>Activity:</b> Grow <b>plants</b> from seed               <ol style="list-style-type: none"> <li>Measure and record plant growth</li> <li>Vary the amount of water and sunlight given to some plants</li> <li>Observe and collect data on plant growth</li> <li>Compare data with that of other students</li> </ol> </li> <li><b>Activity:</b> Draw ways in which <b>seeds</b> can be dispersed</li> <li>Explain that land, air, water, and space make up the <b>environment</b></li> <li>Identify external <b>structures</b> of animals which enable them to move and to obtain food</li> <li>Identify materials used by animals to <b>build their homes</b> in various habitats</li> <li>List ways in which various animals <b>adapt</b> for survival</li> <li>Describe the <b>life cycle</b> of animals</li> <li>Identify basic aspects of the <b>food chain</b> (who eats what)</li> <li>Identify <b>similarities/differences</b> between plants and animals</li> </ol> <p><b><u>Health/Human Body</u></b></p> <ol style="list-style-type: none"> <li>Identify the five <b>senses</b> and the function of each</li> <li>Identify the general location of the <b>heart, lungs, brain, stomach</b></li> <li>Describe the <b>primary functions</b> of the heart, lungs, brain, stomach</li> <li>Explain the primary function of <b>bones and muscles</b></li> <li>Identify ways <b>diseases</b> are spread</li> </ol> </div> <div> <p><b><u>Earth/Physical</u></b></p> <ol style="list-style-type: none"> <li>Name the <b>seasons</b> of the year and their main characteristics</li> <li>Explain how <b>seasonal</b> and <b>weather changes</b> affect plants, animals</li> <li><b>Activity:</b> Read a weather thermometer (Fahrenheit)</li> <li><b>Activity:</b> Record <b>daily weather</b> conditions and temperatures at specified times</li> <li>Describe the main characteristics of the various types of <b>precipitation</b> (rain, snow, ice)</li> <li>Describe <b>safety</b> precautions to take in various storm situations</li> <li>Identify the three <b>forms</b> that water can exhibit</li> <li>Explain that pushing and pulling are two forms of <b>force</b></li> <li>Explain that objects fall or roll downhill because of <b>gravity</b></li> <li><b>Activity:</b> Explore ways of making an object <b>change direction, speed</b> (worksheets)</li> </ol> <p><b><u>Society and Technology</u></b></p> <ol style="list-style-type: none"> <li>Use appropriate tools to <b>gather data</b> (thermometer, rain gauge)</li> <li>Identify ways ordinary people <b>use science</b> (weather, transportation, communication, etc.)</li> </ol> </div> </div>	
Instructional Objectives:	
Procedure:	
Announcements:	
Homework:	Evaluation:

## Grade 2

Students in Grade 2 will:

### Environmental Focus (conserving resources)

1. Recognize and appreciate the many resources earth offers
2. Explain why it is important to **reuse or recycle** materials
3. Describe various ways in which common materials can be reused or recycled

**Resources:** [EPA](#) has lots of ideas for recycling, [Keep Cincinnati Beautiful](#), [Recycle, etc.](#), [Planet Pals](#), [Planet Protector Club](#)

### Life Science (focus on insects)

4. Identify the **main characteristics** of insects
5. Explain the general **life cycle** (growth, development, changes) of insects
6. Discuss representative insects' habitats, predators, preys
7. Identify and appreciate the variety of insects, and explain the role they play in nature
8. Identify various animals that live in **social groups**
9. List the **advantages** some animals gain from living in social groups
10. Identify ways in which natural environments (habitats) meet the **basic needs** of organisms living in them
11. Explain and appreciate the ways nature (God) provides for animal life

**Resources:** [Insects- University of Kentucky Department of Entomology](#), [Plant life cycle 1](#), [Plant life cycle 2](#), [Insects](#) (National Geographic)

### Health/Human Body

12. Identify basic anatomical models of **skin, teeth, eye, ear**
13. Explain the **proper care** of skin, hair, nails
14. Suggest ways to care for the **eyes**
15. Explain what happens in a **vision test**
16. Show how to floss and brush **teeth**
17. Explain what happens in a **dental checkup**
18. Explain proper care of the **ears**
19. Describe what happens in a **hearing test**
20. Suggest two effects of lack of sleep
21. Explain why it is important to care for the bodies God has given us
22. Identify causes and lists means of **preventing accidents** in public places, pedestrian behavior, and in recreational activities
23. Name signs indicating when medical attention is needed
24. Tell things a doctor may do in a health check up
25. Identify the differences between "**good touch**" and "**bad touch**"
26. Recognize certain **lures** that may lead to molestation and/or abduction

**Resources:** [Kid's Health](#), [McGruff](#) (Personal Safety), [Preventing accidents](#), [Safety](#)

## Physical Science

27. Identify sounds produced by plucking, hitting, blowing
  28. Distinguish between **volume** (loudness) and **pitch**
  29. Demonstrate ways of **changing pitch**
  30. **Activity:** Develop a way to produce **sound** (other than voice) that can change volume and pitch
    - a. Observe and record results of the above
    - b. Discuss observations and share data
  31. Explain that sound is produced by vibration and waves
  32. **Activity:** Develop a better way of producing sound based on what was learned from #30
  33. Demonstrate how **motion** can be in many directions
  34. Identify the **variables** which affect moving objects
  35. Identify **friction** (two surfaces rubbing against each other to slow motion)
  36. Compare **speeds** based on personal experience
  37. Predict whether an object in motion will speed up or slow down
  38. **Activity:** Investigate ways to increase/decrease speed, distance object can travel. [Build a ramp.](#)
  39. Identify **physical properties of matter** (color, shape, size, texture)
  40. Identify **physical changes** in matter
  41. Observe and records changes in matter that involve **energy**
  42. Demonstrate that **magnets** have magnetic fields around them
  43. Explain when magnets will **attract or repel** other magnets
- Resources:** [Sound 1](#), [Sound 2](#), [Sound 3](#), [Changing pitch clip](#), [Changing pitch](#), [Matter 1](#), [Magnets](#), [Friction](#), [Friction 2](#), [Force \(ramp\)](#), [Ramp 1](#)

## Society and Technology

44. Use simple tools (e.g. magnifiers, rulers) to **gather data**
45. Answer “how do you know” questions (not “why”) to generate reasoned answers
46. Explain how scientific explanations are based on observations, events, phenomena
47. Discuss why people invent new things or ways of doing things (cell phones vs. telephones; car washes instead of doing your own)
48. Discuss how new inventions or ways of doing things might affect other people or the environment

## **Related Readings**

Animal stories, especially groups of animals are recommended. Books about sound and energy are also good selections for grade 2.

## **Informal Assessment**

Student verbal explanations, identifications, student-made models and/or drawings.

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Date \_\_\_\_\_

Class \_\_\_\_\_

Teacher Materials:	Student Materials:		
<p style="text-align: center;"><b>Gr. 2 Science Objectives</b> <b>Archdiocese of Cincinnati</b></p> <table border="1" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p><b><u>Environmental Focus</u></b></p> <ol style="list-style-type: none"> <li>Recognize and appreciate the many resources earth offers</li> <li>Explain why it is important to <b>reuse or recycle</b> materials</li> <li>Describe various ways in which common materials can be reused or recycled</li> </ol> <p><b><u>Life Science</u></b> (focus on insects)</p> <ol style="list-style-type: none"> <li>Identify the <b>main characteristics</b> of insects</li> <li>Explain the general <b>life cycle</b> (growth, development, changes) of insects</li> <li>Discuss representative insects' habitats, predators, preys</li> <li>Identify and appreciate the variety of insects, and the role they play in nature.</li> <li>Identify various animals that live in <b>social groups</b></li> <li>List the <b>advantages</b> some 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Homework:	Evaluation:		

## Grade 3

Students in grade 3 will:

### Environmental Focus

1. Identify **natural resources** (trees, water, air, etc.)
2. Name natural **energy** resources (coal, petroleum, propane, natural gas, solar, hydropower, wind, biomass, geothermal, nuclear)
3. List **renewable and nonrenewable** natural resources
4. Appreciate the variety and abundance of energy resources God has given us
5. Identify ways people can **save** (conserve) **energy**

Resources: [Energy Ant](#), [\(NEED\) Project](#) (National Energy Education Development), [Solar energy](#), [Renewable energy](#), [Planet Protector Club](#)

### Life Science (focus on reptiles)

6. Identify the **main characteristics** of reptiles, where they live, what they eat, how they are helpful to nature and humans
7. Discuss the general **life cycle** (growth, development, changes) of reptiles
8. Explain the role of reptiles in nature

Resources: [San Diego's Natural History Museum](#), [Reptiles](#) (National Geographic)

### Health/Human Body

9. Describe ways to be safe in **severe weather** conditions
10. Identify healthful and harmful effects of **medications**
11. Identify people from whom children may take medicine
12. List household items that contain **poisons**
13. Describe proper storage of medicines and harmful household products
14. Describe actions that reduce the **risks** of becoming a victim
15. Give examples of **refusal skills** that can be used to say “no” to any risk behavior
16. Recognize each person’s basic right to **bodily privacy and respect**

Resources: [Kids' Health](#)

### Earth/Space Science:

#### **Astronomy**

17. Explain that the **sun** is the center of our **solar system**
18. **Activity:** Demonstrate the relative **positions** of the earth, moon, and sun
19. Explain that the **movement and tilt of the earth** (in relation to the sun) affect our time, temperature, and climate
20. Demonstrate that the earth **revolves and rotates** simultaneously
21. **Activity:** Observe if possible and draw the **phases of the moon**
22. From pattern, **predict** next **full moon**. (fulfills #49 below)
23. Develop a general concept of the **earth’s size** and **it’s position in the solar system**
24. Name the **planets** and their relative positions in the solar system

**Resources:** [Kids Astronomy](#), [NASA's StarChild](#), [Cosmos for Kids](#), [Solar system](#), [Solar system 2](#), [Beyond the Milky Way](#), [Earth rotation](#), [Moon observations](#), [Mars and Jupiter](#), [Mercury and Venus](#), [Outer planets](#), Field trip to [Drake Planetarium](#) in Cincinnati, virtual field trip to [Palomar Observatory](#), [SpacePlace](#) games

### **Geology**

25. Explain **geology** as the science of the earth, how it forms and changes with time and activity
26. Describe how **fossils** are formed
27. **Activity:** Recognize the importance of archeological artifacts [Science Museum of Minnesota](#) and [Sciencenet links](#)
28. Describe the main characteristics of the **earth's layers**
29. Observe and record the physical properties common to **soil**
30. Distinguish between topsoil, subsoil, and bedrock
31. **Activity:** Make a model of the earth's soil layers (there are several [Edible models](#))
32. Explain how heat, pressure, and erosion affects rock formation (rock cycle)
33. Identify the main **characteristics of** igneous, sedimentary, and metamorphic **rocks**
34. Draw the **water cycle**
35. Explain how **weathering** affects rocks and soil
36. Describe the causes and effects of various types of **erosion**

**Resources:** [The Kids Ecology Corps](#), [Life Cycle of a Mineral Deposit](#)), edible [Soil 1](#), [Edible soil 2](#), [Rocks](#), [Rock Hounds](#), [Women in Mining](#). [Fossils](#), [Erosion](#), [Earth rocks!](#), [Water cycle](#), [Landforms](#)

**Note:** Surface features of the earth and various **land and water formations** should be taught in social studies. If they are not, they can be incorporated here.

### **Physical Science**

37. Identify **matter** (glass, paper, wood, etc.) by **physical and chemical properties**
38. Give examples of **physical properties** of gases, liquids, and solids
39. Identify **physical changes** in gases, liquids, and solids
40. List **chemical properties** of gases, liquids, and solids
41. Identify **chemical changes** in gases, liquids, and solids
42. Explain how any **change** in matter involves **energy**
43. Explain that **mass** is the amount of material in an object
44. Identify **volume** as the amount of space an object takes up
45. **Activity:** Compare different objects by mass and by volume (Ex: loaf of bread, book, backpack - which has the greater mass? volume?)

**Resources:** [Chemistry for Kids](#), [Forms of Matter](#), [States of Matter](#), [Matter song](#), [Solids, etc.](#), [Solid, liquid, gas activity](#)

### **Society and Technology**

46. **Activity:** re-design a common object (ex: Build a better pencil [Sciencenet links](#) or similar project)
47. Observe, record, interpret data from student's own project, activity or experiment
48. Read and interpret data others have collected/produced
49. Analyze a series of events, or a daily or seasonal cycle to predict next likely occurrence. (See #22 above)
50. Explain how technology from different areas (transportation, communication, nutrition, healthcare, entertainment, etc.) has improved human lives

**Related readings**

Biographies (Galileo, Copernicus, George Washington Carver, etc.); dinosaurs, fossils, geology, space, solar system, geology

**Informal Assessment**

Student-generated models or drawings of earth layers, rock cycle, moon phases, etc.

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## Grade 4

Students in Grade 4 will:

### Environmental Focus

1. Explain **stewardship** as responsibility for caring for the environment
2. Explain the **necessity of water** for all living entities
3. Explain the importance of **water conservation**
4. Examine sources of **water pollution**
5. Suggest and carry out ways to **conserve water**

**Resources:** [Water Science for Schools](#), [City of Phoenix](#), [Green Frog News](#), [Environment](#), [Plane Protector Club](#)

### Life Science (focus on plants as part of ecosystem study)

6. Explain **photosynthesis** as a food and oxygen producing process (carbon dioxide-oxygen cycle)
7. Discuss and appreciate the interdependence of living things
8. **Activities:** Study the ecosystem of **at least one** land, forest, and water biome:
  - a. Land - desert, wetland, grassland, tundra
  - b. Forests - deciduous, coniferous (taiga), tropical rainforest
  - c. Water - fresh and salt
9. Study ecosystems in terms of understanding:
  - a. How **weather and climate** conditions affect the region
  - b. Major **plant and animal life** of the region
  - c. **Adaptations** made by plants, animals to survive in the biome
  - d. **Food chains and food webs** within the region
  - e. **Dangers or threats to the plants and animals** of the region
  - f. **The diversity and richness of our world**
  - g. Positive and negative **impact of human activity** on the environment (#56)
10. In relation to an environmental area, know what is meant by:
  - a. The **interdependence** of living things and their environment
  - b. **Closed and open** ecosystems
  - c. **Population and controls on population growth**
  - d. **Food chains and food webs**
  - e. How populations **adapt** to their environment
  - f. The importance of **plants** in ecosystems
  - g. Implications of disruptions in food chains or food webs
  - h. **Producers and consumers**
  - i. The function of **decay** in natural systems
  - j. Factors which cause **changes** in natural environments
  - k. **Relationships** within a community (e.g., symbiotic, parasitic, competitive, predatory, etc.)
11. In developing the ecosystem/biome studies, students should know the following:
  - What kind of climate and physical landforms are in this region?
  - How do the seasons affect plants, animals?
  - What kinds of plants, animals, birds, trees, etc. would you see here?
  - How do the plants and animals survive the changes in seasons?
  - How do all these species interact to help, hinder each other?
  - Describe/draw food chains and food webs in this biome

How is the area changing? What is changing it?  
How is this affecting the other organisms that live in this biome?

**Resources:** [Pete's PowerPoint Presentations](#), [Biomes](#), [Biomes 2](#), [Young Scientist's Introduction to Wetlands](#), [Habitat project](#), [Food chain](#), [Plants 1](#), [Plants 2](#), [Plants 3](#), [Plants 4](#), [Plants 5](#), [Food chain](#), [Decomposers](#), [Environments and ecosystems](#), [Water cycle/rainwater](#)

### Health/Human Body

11. Explain the concept of **symptoms** relating to disease
12. Distinguish between **communicable and non-communicable** diseases
13. Explain **immunizations**
14. Name the main organs that make up the **digestive system**
15. Identify foods that belong to each section of the **food pyramid**
16. Name some **foods** that are not healthy when eaten often
17. Identify **healthy foods** for meals and snacks
18. Explain why **breakfast** is important
19. Discuss the need for **water** to maintain health
20. Define and identify "**fast foods**"
21. **Activity:** Maintain a "food log" for several days and analyze it
22. Read and interpret information on **food labels**
23. Discuss **calories** and their impact on health and nutrition
24. Discuss **ideal weight** and how to achieve/maintain it
25. Explain one's responsibility to take care of the body God has given us
26. Give examples of **refusal skills** that can be used to say "no" to any risk behavior
27. Discuss each person's basic right to **bodily privacy and respect**

**Resources:** [MyPyramid for Kids](#) (US Dept. of Agriculture), [NIDA](#) (The National Institute on Drug Abuse), [Food labels](#)), [Fast food facts](#), [Mechanical energy and food](#), [Food minerals](#)

### Physical Science

28. Identify types of **frictional, gravitational, and mechanical forces**
29. Predict the **effects of force** on an object
30. Identify various examples of **kinetic energy** (energy in action)
31. Identify various examples of **potential energy** (stored or position energy)
32. Explain **speed** as the measure of how far something travels in a certain period of time
33. **Activity:** explore the six classes of **simple machines**
34. Describe the advantages of using simple machines  
(Relate to small hardware device such as an egg beater, can opener, cork screw, car jack, garlic press, ice cream scoop, salad tongs, nutcracker, monkey wrench, hand drill, Vise-Grips, wind-up toy, pencil sharpener, stapler, etc.)

**Resources:** [Simple machines](#), [Simple machines 2](#), [Systems](#), [Friction](#), [Simple machines 3](#), [Simple machines 4](#), [Simple machines 5](#), [Pulleys](#), [Wedge](#), [Inclined plane/screw](#)

### Society and Technology

35. Discuss positive and negative impacts of human activity on the environment
36. Describe how technology can extend human abilities, e.g. simple machines (see #36 above)
37. **Activity:** [Develop, design a simple product \(ex: paper airplane, kite, picnic tablecloth securer\), or conduct a simple investigation or experiment \(see resources below\)](#)
38. Identify potential hazards and/or precautions involved in an investigation
39. Record the results and data from an investigation and make a reasonable explanation.
40. Read and interpret simple tables and graphs produced by self/others
41. Explain why keeping records of observations and investigations is important

42. Explain why an experiment must be repeated by different people or at different times or places and yield consistent results before the results are accepted

**Resources:** [Sample Project for Activity above](#), [Project 1](#) (Exploring animal environments), [Project 2](#) (geometric creatures), [Project 3](#) (trunk design)

### **Related Readings**

Trade books relating to biomes, natural habitats, endangered species, simple machines

### **Informal Assessment**

Have students draw a food web for the various species identified in the biome.

Examples of biomes, endangered species, adaptations, chronic diseases can show understanding of concepts. Students might construct charts or webs showing the interrelatedness of climate, habitats, species, etc. Teacher might give conditions of an imaginary “biome” and ask students to predict what type of plant and animal life it might sustain, what adaptations would need to be made, and what a possible food chain might be.

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Date \_\_\_\_\_

Class \_\_\_\_\_

<b>Teacher Materials:</b>	<b>Student Materials:</b>
<p style="text-align: center;"><b>Grade 4 Science Objectives Archdiocese of Cincinnati</b></p> <div style="display: flex;"> <div style="flex: 1;"> <p><u><b>Environmental Focus</b></u></p> <ol style="list-style-type: none"> <li>1. Explain <b>stewardship</b> as responsibility for caring for the environment</li> <li>2. Explain the <b>necessity of water</b> for all living entities</li> <li>3. Explain the importance of <b>water conservation</b></li> <li>4. Examine sources of <b>water pollution</b></li> <li>5. Suggest and carry out ways to <b>conserve water</b></li> </ol> <p><u><b>Life Science</b></u> (focus on plants as part of ecosystem study)</p> <ol style="list-style-type: none"> <li>6. Explain <b>photosynthesis</b> as a food and oxygen producing process</li> <li>7. Develop an appreciation for the interdependence of living things</li> <li>8. <b>Activities:</b> Study the ecosystem of <b>at least one</b> land, forest, and water biome</li> <li>9. Study the ecosystems in terms of understanding: <b>weather and climate, plant and animal life, Adaptations, Food chains and food webs, Dangers or threats</b> the region, <b>diversity and richness of our world, impact of human activity</b></li> <li>10. In relation to an environmental area, know what is meant by: <b>Interdependence, closed and open ecosystems, population and controls, food chains and food webs, adaptations, plants, producers and consumers, decay, relationships</b> within a community</li> </ol> <p><u><b>Health/Human Body</b></u></p> <ol style="list-style-type: none"> <li>11. Explain the concept of <b>symptoms</b> relating to disease</li> <li>12. Distinguish between <b>communicable and non-communicable</b> diseases</li> <li>13. Explain <b>immunizations</b></li> <li>14. Name the main organs that make up the <b>digestive system</b></li> <li>15. Identify foods that belong to each section of the <b>food pyramid</b></li> <li>16. Name some <b>foods</b> that are not healthy when eaten often</li> <li>17. Identify <b>healthy foods</b> for meals and snacks</li> <li>18. Explain why <b>breakfast</b> is important</li> <li>19. Discuss the need for <b>water</b> to maintain health</li> <li>20. Define and Identify “<b>fast foods</b>”</li> <li>21. <b>Activity:</b> Maintain a “food log” for several days and analyze it</li> </ol> </div> <div style="flex: 1;"> <ol style="list-style-type: none"> <li>22. Read and interpret information on <b>food labels</b></li> <li>23. Discuss <b>calories</b> and their impact on health and nutrition</li> <li>24. Discuss <b>ideal weight</b> and how to achieve/maintain it</li> <li>25. Explain one’s responsibility to take care of the body God has given us</li> <li>26. Give examples of <b>refusal skills</b> that can be used to say “no” to any risk behavior</li> <li>27. Discuss each person’s basic right to <b>bodily privacy and respect</b></li> </ol> <p><u><b>Physical Science</b></u></p> <ol style="list-style-type: none"> <li>28. Identify types of <b>frictional, gravitational, and mechanical forces</b></li> <li>29. Predict the <b>effects of force</b> on an object</li> <li>30. Identify various examples of <b>kinetic energy</b> (energy in action)</li> <li>31. Identify various examples of <b>potential energy</b></li> <li>32. Explain <b>speed</b> as the measure of how far something travels in a certain period of time</li> <li>33. <b>Activity:</b> explore the six classes of <b>simple machines</b></li> <li>34. Describe the advantages of using simple machines</li> </ol> <p><u><b>Society and Technology</b></u></p> <ol style="list-style-type: none"> <li>35. Discuss positive, negative impacts of human activity on the environment</li> <li>36. Describe how technology can extend human abilities,</li> <li>37. <b>Activity:</b> <b>Develop, design a simple product</b></li> <li>38. Identify potential hazards and/or precautions involved in an investigation</li> <li>39. Record the results and data from an investigation and make a reasonable explanation.</li> <li>40. Read and interpret simple tables and graphs produced by self/others</li> <li>41. Explain why keeping records of observations and investigations is important</li> <li>42. Explain why an experiment must be repeated before the results are accepted</li> </ol> </div> </div>	<p><b>Instructional Objectives:</b></p> <hr/> <p><b>Procedure:</b></p> <hr/> <p><b>Announcements:</b></p>
<b>Homework:</b>	<b>Evaluation:</b>

## GRADE 5

Students in Grade 5 will:

### Environmental Focus

1. Explain what constitutes good **air quality** (connect to earth science)
2. Identify activities that threaten air quality
3. List sources, indications of **noise pollution** (connect to physical science - sound)
4. Identify **health issues** related to air and noise pollution
5. **Activity:** make a poster to suggest ways of eliminating air and/or noise pollution

**Resources:** [Air Junk](#), [Regional Ozone Coalition](#), [HCDOS's site](#), [Environment 1](#), Air pollution and acid rain experiments [Click here](#), [Environment](#), [EPA](#), [Dirty air](#), [Air pollutants](#), [Indoor air pollutants](#), [Cleaning air](#), [Air quality and pollution](#), [Planet Protector Club](#)

**Life Science** (focus on amphibians- connect to weather as cold-blooded creatures, and to air quality as thin skinned.)

6. Identify the **main characteristics** of amphibians
7. Explain the contribution of amphibians to nature
8. Discuss the general **life cycle** (growth, development, changes) of amphibians
9. Identify representative amphibians' habitats, predators, preys

**Resources:** [Frogwatch USA](#), [All About Frogs](#), [Kidport](#), [Amphibians](#) (National Geographic)

**Health/Human Body** (add reproductive system if family life or sex education is included in grade 5)

10. Analyze factors (diet, exercise, personal behavior) that influence fitness and health
11. Identify **eating disorders** and their effects on the body
12. Discuss how smoking, alcohol, and other **drugs** affect our body systems
13. Describe ways **nicotine** may be harmful to health
14. Identify how **smoke** can be hazardous to others (second-hand smoke, fires)
15. Give examples of **refusal skills** that can be used to say "no" to any risk behavior
16. Give examples of how we recognize each person's basic right to **bodily privacy and respect**

**Resources:** [Fast Foods Facts](#), [Diet Riot](#), [DARE](#), [Kids' Health](#) (query smoking)

**Earth/Space Science** (Astronomy and Meteorology)

#### **For Review:**

Weather and climate, **rotation and revolution** of earth, moon; general characteristics of **sun**; **planets** and their relative positions in the solar system; air pressure [Properties of Air](#) (air pressure)

#### **For Development:**

17. Explain or demonstrate that warm air rises and cold air sinks
18. **Activity:** Demonstrate air pressure [Properties of Air](#)
19. Describe how air pressure changes due to altitude or moisture content of the air
20. Explain how low and high air pressure affect weather
21. **Activity:** Make and use a weather instrument (see Resources)
22. **Activity:** Read and interpret a weather map

23. Explain the differences between thunderstorms, tornadoes, hurricanes, and blizzards
24. Define **astronomy** as the study planets, stars, galaxies, and other objects in space (as opposed to astrology)
25. Discuss some of the **major developments in and contributors to astronomy** (see [ScienceSaurus](#) time line)
26. Relate **equinox and solstice** to seasons of the year
27. Demonstrate the relative **positions** of the earth, moon, and sun during a solar and lunar eclipse
28. Explain that our **solar system** is located in the Milky Way
29. Identify **light year** as a measure of distance in space
30. Explain a star's **stages of development** from "birth" to "death"
31. Discuss how **constellations** were named for mythological entities
32. Identify and locate major **stars and constellations**

**Resources:** [Weather 1](#), [Web Weather for Kids](#), [Making a Barometer](#), [Making a Hair Hygrometer](#), [Making an Air Thermometer](#), [Making a Weather Vane](#), [Making a Wind Anemometer](#), [Making a Wind Sock](#), [Making a Wind Vane](#), [Harnessing the wind](#), [Weather and pollution](#), [NASA's Space Place](#), [Space Foundation](#), [Comets, etc.](#), [Stars and constellations](#), [Solar system](#), [Space travel](#), [International space station](#), [Drake planetarium](#) (Field trip or in class program), [SpacePlace](#) (games)

## Physical Science

### Sound

#### For Review:

Distinguish between **volume** (loudness) and **pitch**; ways of **changing pitch**; how sound is produced

#### For Development:

33. Identify the **properties of sound** perceived by humans
34. Discuss that **loudness** is measured in decibels
35. Explain how **sound waves** need to move through a substance
36. Demonstrate the relationship between **frequency** and **pitch**

**Resources:** [Sound waves](#), [Sound 2](#), [Sound waves 3](#), [Decibels](#), [Experiments](#), [more sound experiments](#), [more on sound](#)

### Chemistry

#### For Review:

**Matter**; physical and chemical properties; physical changes; chemical changes; that change in matter involves **energy**; mass and volume

#### For Development:

37. Discuss the basic structure of an **atom**
38. Distinguish between **atom, element, and molecule**
39. Identify **compounds, solutions and mixtures**

**Resources:** [Chem4Kids](#), [Atoms](#)

### Energy/Electricity

40. Explain that there is a magnetic field around an **electrical current**
41. Demonstrate that moving a wire through a magnetic field produces an electric current
42. **Activity:** Construct an **electromagnet**
43. Distinguish between **static and current** electricity
44. Identify **open and closed** circuits
45. **Activity:** Construct a **parallel and a series** circuit
46. Distinguish between **electrical conductors and insulators**
47. Explain how **heat energy transfers** in friction and conduction

48. Discuss that most materials **expand** when heated and **contract** when cooled
49. Identify **heat conductors and insulators**
50. Observe and record various objects that absorb **radiant energy** and those which reflect it

**Resources:** [Electricity](#), [Electricity 1](#), [Electricity 2](#), [Electricity 3](#), [Electrical Circuits and switches](#), [Elec. Activities from ACS](#), [Conductors](#), [Changing circuits](#), [Magnets and Metals](#), [Electricity 4](#), [Flow of energy](#), [Static/current electricity](#)

### **Society and Technology**

51. Discuss how technology may improve life (cell phones, microwave ovens, air conditioning)
52. Discuss how technology and inventions change to meet people's needs and wants
53. **Activity:** Use a simple design process to solve a problem (identify a problem (e.g. how to keep the picnic tablecloth from blowing off). Identify possible solutions, and design a solution (see [ScienceSaurus](#), *Science, Technology and Society*)
54. Evaluate the design process used to solve the problem (were several solutions considered? How was the specific solution decided upon? How well did it work?)
55. Revise the previous design
56. Identify one or two variables in a simple experiment
57. Differentiate fact from opinion in regard to scientific claims

**Resources:** [Design process](#), [Project 1](#) (light), [Project 2 \(bridge\)](#), [Project 3](#) (playground)

### **Teachers' Notes:**

Air quality can be integrated with amphibians in that they breathe through their skin and extract oxygen from water. Acid rain can be connected to lessons on weather.

### **Related Readings**

Solar system, space exploration; amphibians; air pollution; atoms; electricity; how things work; biographies of scientists

### **Informal Assessment**

Student-made models, drawings, presentations; role playing first aid incidents; troubleshooting scenarios ("John's electric train wouldn't move. What might be wrong?")

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<div><div><div><div>Environmental Focus</div><div>1. Explain what constitutes good <b>air quality</b></div><div>2. Identify activities that threaten air quality</div><div>3. List sources of <b>noise pollution</b></div><div>4. Identify <b>health issues</b> related to air, noise</div><div>5. <b>Activity:</b> make a poster to suggest ways of eliminating air and/or noise pollution</div><div>Life Science, (amphibians)</div><div>6. Identify <b>main characteristics</b></div><div>7. Explain amphibians’ contribution to nature</div><div>8. Discuss the <b>life cycle</b> of amphibians</div><div>9. Identifies representative amphibians’ habitats, predators, preys</div><div>Health/Human Body</div><div>10. Analyze factors influencing health</div><div>11. Identify <b>eating disorders</b> and their effects on the body</div><div>12. Discuss how smoking, alcohol, and other <b>drugs</b> affect our body systems</div><div>13. Describe ways <b>nicotine</b> harms health</div><div>14. Identify <b>smoke</b> as hazardous to others</div><div>15. Give examples of <b>refusal skills</b></div><div>16. Give examples of how we recognize basic right to <b>bodily privacy, respect</b></div><div>Earth/Space</div><div>17. Explain or demonstrate that warm air rises, cold air sinks</div><div>18. <b>Activity:</b> Demonstrate air pressure</div><div>19. Describe how air pressure changes due to altitude or moisture content of the air</div><div>20. Explain how low and high air pressure affects weather</div><div>21. <b>Activity:</b> Make and use a weather instrument</div><div>22. <b>Activity:</b> Read, interpret a weather map</div><div>23. Explain the differences between thunderstorms, tornadoes, hurricanes, and blizzards</div><div>24. Define <b>astronomy</b> as the study planets, stars, galaxies, and other objects in space</div><div>25. Discuss <b>major developments</b> in and <b>contributors</b> to astronomy</div><div>26. Relate <b>equinox</b> and <b>solstice</b> to seasons</div><div>27. Demonstrate the relative <b>positions</b> ... during a solar and lunar eclipse</div><div>28. <b>Explain that our solar system</b> is located in Milky Way</div><div>29. Identify <b>light yr.</b> as measure of distance</div><div>30. Explain a star’s <b>stages of development</b></div><div>31. Discuss how <b>constellations</b> were named for mythological entities</div><div>32. Identify and locate major <b>stars</b> and <b>constellations</b></div></div><div><div>Physical Science</div><div>33. Identify the <b>properties of sound</b></div><div>34. Measures <b>loudness</b> in decibels</div><div>35. Explain how <b>sound waves</b> move</div><div>36. Relates <b>frequency</b> and <b>pitch</b></div><div>Chemistry</div><div>37. Discuss basic structure of <b>atom</b></div><div>38. Distinguish <b>atom, element, and molecule</b></div><div>39. <b>Identify compounds, solutions and mixtures</b></div><div>Energy/Electricity</div><div>40. Explain that there is a magnetic field around an <b>electrical current</b></div><div>41. Demonstrate that moving a wire through a magnetic field produces an electric current</div><div>42. <b>Activity:</b> Construct <b>electromagnet</b></div><div>43. Distinguish between <b>static and current</b> electricity</div><div>44. Identify <b>open and closed circuit</b></div><div>45. <b>Activity:</b> Construct a <b>parallel and a series</b> circuit</div><div>46. Distinguish between <b>electrical conductors and insulators</b></div><div>47. Explain how <b>heat energy transfers</b></div><div>48. Discuss that most materials <b>expand</b> heated and <b>contract</b> when cooled</div><div>49. Identify <b>heat conductors and insulators</b></div><div>50. Observe and record various objects that absorb, reflect <b>radiant energy</b></div><div>Society and Technology</div><div>51. Discuss how technology may improve life</div><div>52. Discuss how technology and inventions change to meet people’s needs and wants</div><div>53. <b>Activity:</b> Use a simple design process to solve a problem</div><div>54. Evaluate the design <b>process</b> used to solve the problem Revise the previous design</div><div>55. Revise previous design</div><div>56. Identify one or two variables in a simple experiment</div><div>57. Differentiate fact from opinion in regard to scientific claims</div></div></div></div>		Procedure:	
		Announcements:	
Homework:		Evaluation:	

## GRADE 6

Students in Grade 6 will:

### Environmental Focus

1. Discuss **endangered species** and **invasive species** (zebra mussels in the Great Lakes, kudzu, etc.)
2. List the effects of losing a species
3. Explain the advantages of **biodiversity**

**Resources:** [Endangered Species](#), [Endangered species coloring book](#), [US Fish and Wildlife Service](#), [Environment](#), [Make-a-Difference campaign](#)

### Life Science (focus on mammals)

4. Identify the **main characteristics** of mammals
5. Identify several land and sea mammals (largest, smallest, strangest, etc.)
6. Discuss representative mammals' habitats, predators, preys

**Resources:** [Mammals 1](#), [Mammals 2](#), [Mammals 3](#), [Mammals quiz](#)

7. List the predominant theories concerning the **origin of life**
8. Identify factors of **evolutionary process** which produce changes in a species
9. Explain that in all **classification** schemes, organisms are grouped on the basis of common characteristics
10. Explain or identify **basic characteristics/examples** of the <sup>1</sup>**Five-Kingdom Classification System**:
  - a. Monera (bacteria; no true nucleus)
  - b. Protista (one-celled, simple multi-celled organisms with true nuclei)
  - c. Fungi (many-celled organisms that reproduce by spores -molds; yeasts; mushrooms)
  - d. Plant kingdom (plants with cell walls that produce food through photosynthesis)
  - e. Animal kingdom (all animals eat other organisms)
    - i. Invertebrates (insects, worms, sponges, etc.)
    - ii. Vertebrates
      1. amphibians
      2. fish
      3. reptiles
      4. birds
      5. mammals
11. Explain how **kingdoms** are further subdivided (phylum, class, etc.)
12. **Activity:** Use **dichotomous keys** to identify species

**Resources:** [Classification](#), [Five kingdoms](#), [Origins of life](#), [Viruses](#)

### Cell Theory

13. Identify the **cell** as the basic unit of living structures
14. Identify the general **structure** of a **plant** and an **animal cell**
15. **Activity:** Make a model of an animal or a plant cell. Explain what each structure does for the cell.
16. Identify the cellular processes for **food acquisition** and **respiration**
17. Distinguish between **unicellular** and multi-cellular organisms
18. Explain that most **multicellular** organisms are organized into tissues, organs, and systems

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<sup>1</sup> There is a sixth kingdom, archebacteria (ancient forms). This can be mentioned, but at this level it is not necessary to "study" this kingdom.

Resources: [Cells](#), [Cells 2](#), [Cells 3](#), [Cells 4](#)

## Plant Life

19. Identify the major parts of a **seed** and describe their functions
20. Explain various types of plant **reproduction** (spores, seeds, bulbs, cuttings)
21. Discuss the ways in which **pollen** is carried to the stigma for pollination (e.g. wind, insects, etc.)
22. Explain the effects of moisture, temperature, oxygen, and light on seed **germination** and growth (**tropisms**)
23. Identify the parts of a **flower** and describe their functions
24. Identify the structure and function of the **vascular** system in plants
25. Explain **photosynthesis**
26. Identify **photosynthesis** as both a respiratory process and a food process

Resources: [Photosynthesis 1](#), [Photosynthesis 2](#), [Plants 1](#), [Plants 2](#), [Photosynthesis 3](#)

## Introduction to Genetics

27. Explain how the "blueprint" of an organism is passed from cell to cell by duplication of DNA
28. Explain the relationship of DNA, chromosomes and genes
29. Discuss the **difference** between **meiosis** and **mitosis**, asexual and sexual cell division
30. Demonstrate (**Punnett square**) the genetic basis for determination of **sex** in an individual
31. Predict single **trait** expression in off-spring using Punnett squares
32. Identify common traits in humans which are dominant and recessive
33. Identify **common disorders** transmitted through the sex genes (hemophilia, color blindness)

Resources: [Genetics 1](#), [Genetics 2](#), [Genetics 3](#), [Punnett square 1](#), [Punnett square 2](#), [Dominance/recessive ness](#)

## Health/Human Body

34. Identify the **major organs** and **general function** of the following systems:
  - a. Skeletal system
  - b. Muscular system
  - c. Circulatory system
  - d. Digestive system
  - e. Excretory system
  - f. Respiratory system
  - g. Nervous system
  - h. Reproductive system
  - i. Endocrine system
  - j. Immune system
35. Explain what each major system contributes to proper bodily function
36. Demonstrate basic **first aid procedures** for treating medical emergencies for:
  - a. Bleeding
  - b. Burns
  - c. Choking (Heimlich maneuver)
  - d. Head injuries
  - e. Snake and insect bites
  - f. Shock
37. Give examples of **refusal skills** that can be used to say "no" to any risk behavior, including the use of alcohol and tobacco
38. Give examples of how to show consideration for someone's basic right to **bodily privacy and respect**

**Resources:** [Kid's Health](#) (body systems), [Body systems1](#) (scroll down), [Body systems 2](#), [and more](#), [Education World](#) ("The Human Body: An Online Tour"), [Mayo Clinic](#) (first aid), [Health World](#), [Body systems](#), [Circulatory system](#), [Circulatory system 2](#), [Respiratory System](#), [Respiratory system 2](#), [Digestive system](#), [Immune system](#), [Urinary system](#), [Nervous system](#), [Skeletal system](#), [Endocrine system](#)

## **Society and Technology**

39. Describe ways that using technology can have helpful and/or harmful results (e.g. pesticides)
40. Explain how the solution to a problem may create other problems (non-native species of plants, animals such as in Australia, kudzu in the South)
41. Explain how decisions about the use of various products can result in desirable or undesirable consequences (plastic bags, disposable baby diapers, bottled water)
42. Describe how automation (robotics) has changed manufacturing
43. Discuss why there are not fixed procedures for guiding scientific investigations, that the nature of the investigation determines the procedures needed.
44. Activity: Make a chart showing the differences in how you would investigate three different ideas (ex. What would make a paper airplane fly farthest; which of two different plants would survive best in a drought or cold or...; what would make ice melt faster.)
45. Explain how hypotheses are valuable even when they are not supported

**Resources:** [Robotics](#), [Robotics 2](#)

## **Related readings**

Newspaper articles, books related to endangered and invasive species; various classes of animals; plant life and propagation; issues involving genetics; health, diet, exercise

## **Informal Assessment**

Student-made models, charts, diagrams, drawings; multimedia presentations; ability to use dichotomous keys; comparisons between various species; ability to design the propagation or management of a species in a particular environment (how to control the deer population in an area)

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Date \_\_\_\_\_

Class \_\_\_\_\_

Teacher Materials:	Student Materials:
<p style="text-align: center;"><b>Grade 6 Science Objectives</b> <b>Archdiocese of Cincinnati</b></p> <div style="display: flex;"> <div style="flex: 1;"> <p><b><u>Environmental Focus</u></b></p> <ol style="list-style-type: none"> <li>1. Discuss <b>endangered</b> and <b>invasive species</b></li> <li>2. List the effects of losing species</li> <li>3. Explain the advantages of <b>biodiversity</b></li> </ol> <p><b><u>Life Science</u></b> (focus on mammals)</p> <ol style="list-style-type: none"> <li>4. Identify <b>main characteristics</b></li> <li>5. Identify several land and sea mammals</li> <li>6. Discuss representative mammals' habitats, predators, preys</li> <li>7. List theories concerning the <b>origin of life</b></li> <li>8. Identify factors of <b>evolutionary process</b></li> <li>9. Explain that in all <b>classification</b> schemes, organisms are grouped on the basis of common characteristics</li> <li>10. Explain or identify <b>basic characteristics of Five-Kingdom Classification System</b></li> <li>11. Explain how <b>kingdoms</b> are subdivided</li> <li>12. Activity: Use <b>dichotomous keys</b> to identify species</li> </ol> <p><b><u>Cell Theory</u></b></p> <ol style="list-style-type: none"> <li>13. Identify <b>cell</b> as basic unit, living things</li> <li>14. Identify <b>plant</b> and an <b>animal cell</b></li> <li>15. Activity: Make a model of an animal or a plant cell. Explain cell structures.</li> <li>16. Identify how cell gets <b>food, respiration</b></li> <li>17. Distinguish between <b>unicellular</b> and multi-cellular organisms</li> <li>18. Explain that most <b>multi-cellular</b> organisms are organized into tissues, organs, and systems</li> </ol> <p><b><u>Plant Life</u></b></p> <ol style="list-style-type: none"> <li>19. Identify parts of a <b>seed</b> and functions</li> <li>20. Explain types of plant <b>reproduction</b></li> <li>21. Discuss the ways in which <b>pollen</b> is carried to the stigma for pollination</li> <li>22. Explain the effects of moisture, temperature, oxygen, and light on seed <b>germination</b> and growth (<b>tropisms</b>)</li> <li>23. Identify parts of a <b>flower</b> and functions</li> <li>24. Identify the structure and function of the <b>vascular</b> system in plants</li> <li>25. Explain photosynthesis</li> <li>26. Identify photosynthesis as food and energy process</li> </ol> <p><b><u>Introduction to Genetics</u></b></p> <ol style="list-style-type: none"> <li>27. Explain how the "blueprint" of an organism is passed from cell to cell by duplication of DNA</li> <li>28. Explain the relationship of DNA, chromosomes and genes</li> <li>29. Discuss the <b>difference</b> between <b>meiosis and mitosis</b>, asexual and sexual cell division</li> </ol> </div> <div style="flex: 1;"> <ol style="list-style-type: none"> <li>30. Demonstrate the genetic basis for determination of <b>sex</b> in an individual</li> <li>31. Predict single <b>trait</b> expression in offspring using Punnett squares</li> <li>32. Identify common traits in humans which are dominant and recessive</li> <li>33. Identify <b>common disorders</b> transmitted through the sex genes</li> </ol> <p><b><u>Health/Human Body</u></b></p> <ol style="list-style-type: none"> <li>34. Identify the <b>major organs and general function</b> systems: Skeletal, Muscular, Circulatory, Digestive, Excretory, Respiratory, Nervous, Reproductive, Endocrine, Immune</li> <li>35. Explain what each major system contributes to proper bodily function</li> <li>36. Demonstrate basic <b>first aid procedures</b> for: Bleeding, Burns, Choking (Heimlich maneuver), Head injuries, Snake and insect bites, Shock</li> <li>37. Give examples of <b>refusal skills</b></li> <li>38. Give examples of how to show consideration for someone's basic right to <b>bodily privacy and respect</b></li> </ol> <p><b><u>Society and Technology</u></b></p> <ol style="list-style-type: none"> <li>39. Describe ways that using technology can have helpful and/or harmful results</li> <li>40. Explain how the solution to a problem may create other problems</li> <li>41. Explain how decisions about the use of various products can result in desirable or undesirable consequences</li> <li>42. Describe how automation (robotics) has changed manufacturing</li> <li>43. Discuss why there are not fixed procedures for guiding scientific investigations</li> <li>44. Activity: Make a chart showing the differences in how you would investigate three different ideas</li> <li>45. Explain how hypotheses are valuable even when they are not supported</li> </ol> </div> </div>	
Instructional Objectives:	
Procedure:	
Announcements:	
Homework:	Evaluation:

## GRADE 7

Students in Grade 7 will:

### Environmental Focus

1. Identify activities that damage **land/ land productivity** (connect to geology, meteorology)
2. Identify sources, indications of **water pollution** (connect water issues to oceanography)

Resources: [EPA](#), [Make-a-Difference campaign](#), [Rumpke virtual tour](#)

### Life Science (focus on fish - connect to oceanography)

3. Explain that fish can be fresh water or salt water inhabitants
4. Identify the **main body structures** of fish and their functions
5. Discuss **habitats, predators, preys** in relation to fish
6. List human activities that threaten fish populations

Resources: [Fish](#) (National Geographic), [Fish 2](#), [Fish 3](#), [Fish anatomy](#)

### Earth/Space Science

#### **Astronomy**

##### **For Review:**

**Astronomy** as the study of bodies in space and their interrelationships, **solar system, light year; solar eclipse and lunar eclipse; movement and tilt** of the earth (in relation to the sun); earth's **revolution and rotation, phases of the moon**

##### **For Development:**

7. Identify various theories about the **origins** of the universe
8. Explain how **nuclear reactions** (fusion) within the sun are the sun's primary energy source
9. Discuss how **galactic systems** are held together by gravity
10. Explain how the moon's **gravitational pull** affects ocean tides (see #46)
11. Identify natural objects in the solar system (comets, meteoroids, etc)
12. Identify major events in the historical development of the US **space program**

Resources: [Kidport Reference Library](#), [Space Foundation](#) (material on space, moon landing, shuttles, Discover Space is a great space link), [Kids Astromony](#), [NASA Space Place](#), [Space Place](#) games

#### **Meteorology**

##### **For Review:**

**Meteorology** as the study of atmospheric and weather conditions; that **air** is matter; difference between weather and climate; **water cycle**; warm air rises and cold air sinks

##### **For Development:**

13. Name the main gases that comprise the atmosphere
14. Describe the **jet stream** and its effect on the weather
15. Explain the "Greenhouse Effect"
16. Discuss why land and water absorb and retain heat at different rates
17. Define **humidity** as the amount of moisture present in the air

18. Explain how air masses (fronts) and air (barometric) pressure affect weather
19. Explain relative humidity and dew point
20. Explain how **clouds** are formed
21. Identify the main characteristics (types) of cloud
22. List the conditions needed to produce fog, dew, and frost
23. Explain the causes of **lightning** and **thunder**
24. **Activity:** Demonstrate how to read/interpret a weather map
25. Explain the function and use of major weather measurement instruments

**Resources:** [Weather basics](#), [Forecasting](#), [Meteorology 1](#), [Meteorology 2](#), [Meteorology 3](#), [Meteorology 4](#), [Weather folklore](#), [Windward](#): (*Outsmart the Weather in a Race Around the World*) [Air pressure](#), [Air pressure 2](#)

## Geology

### For Review:

Geology; how **fossils** were formed; main characteristics of the **earth's layers**; the **rock cycle**; characteristics of igneous, sedimentary, and metamorphic rocks; **weathering**; **erosion**

### For Development:

26. Explain how life forms developed through various **geologic eras**
27. Describe the activities of **plate tectonics**
28. Interpret information about the **surface** of the earth from maps and globes
29. **Activity:** from a **topographic map**, identify the high and low points of an area
30. Describe characteristics and properties common to **minerals**
31. Identify minerals by testing their chemical and physical properties
32. **Activity:** grow crystals or identify crystalline substances
33. Explain how igneous, sedimentary, and metamorphic rocks are formed (rock cycle)
34. Explain the processes by which **fossil fuels** such as coal, petroleum and natural gas are formed
35. Explain the relationship between volcanic activity, earthquakes, and mountain building
36. List the main causes of **earthquakes**
37. Describe various ways **mountains** are formed
38. Explain how **river systems** are formed
39. Describe ways in which running water creates/restructures land forms
40. Describe the effect of glacial action on the earth's surface

**Resources:** [Montana Bureau of Mines and Geology](#), [virtual Cave Trip](#), [Crystals 1](#), [Crystals 2](#), [Rock cycle](#), [topo map](#)

## Oceanography

41. Define **oceanography** as the study of ocean life and forms
42. Identify **topographical features** on the ocean floor that are similar to those on land
43. Distinguish between seawater and fresh water
44. Identify basic **differences** between fresh water/salt water inhabitants
45. Explain the influence that oceans have on the temperature and climate of the earth
46. Explain what causes **tides** (see #10)
47. Identify various **coastal environments** (estuaries, swamps, tidal flats)
48. Explain the importance of coastal environments to marine and shore life
49. Identify ways in which humans have affected the oceans (e.g., fishing, off-shore drilling, dredging, building jetties, etc.)
50. Identify various types of ocean **pollution** (e.g., oil spills, etc.)
51. Explain the effect of pollution on marine life

**Resources:** [Kids On Line Resources](#) (Oceanography), [Tides](#) (are the subject of *Water on the Move*) [Secrets at Sea](#) (a web game that teaches basic oceanography) [Waves 1](#), [Waves 2](#), [Mapping the marine environment](#)

## Society and Technology

### **For Review:**

Identify the steps used in scientific inquiry (hypothesis, experimentation, analysis, conclusion)

### **For Development:**

52. Explain how decisions to develop and use technologies often put environmental and economic concerns in direct conflict with each other (ex. higher cost of recycled products)
53. Explain how variables (dependent and independent) and controls can affect the results of an investigation
54. **Activity:** Identify all the possible variables in a scientific investigation and how one might control those.
55. Identify faulty reasoning and statements that go beyond the evidence, or misinterpret the evidence
56. Discuss why repetition of an experiment /reproducibility of results is essential to reduce bias

**Resources:** [Environmental economics](#), [Variable and control](#)

### **Related Readings**

Myths connected with astronomy; stories of space exploration, flight; weather-related stories; books on natural disasters (volcanoes, earthquakes, etc.) biographies of explorers and adventurers; careers in earth/space sciences

### **Informal Assessment**

Student could track weather conditions, compose weather reports; explain weather phenomenon to lower-grade students; build models of land forms, write their own histories of space exploration, speculate on the future of space exploration; design teaching charts for younger students.

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## Grade 8

Students in Grade 8 will:

### Matter and change

#### For Review:

Matter; common phases or states of matter (gases, liquids, solids); physical properties and physical changes of matter; chemical properties and chemical changes of matter; any change in matter involves energy; most materials expand when heated and contract when cooled; solutions and mixtures.

#### For Development:

##### Students will:

1. Identify **chemical reactions** in terms of reactants and products
2. List factors affecting the **rate of chemical reactions**
3. Measure the **volume** of various objects
4. Compare **densities** of various substances
5. Explain the relationship between **mass, volume, and density**
6. Explain the effects of height and depth on **pressure**

**Resources:** [Chem 1](#), [Properties of matter](#), [Properties of matter 2](#), [Chem reactions](#), [Kidport](#) (for light, energy and matter, chemistry, physics and math) [Chem reactions from ACS](#), [Kids Online Resources](#)

### Atomic Structure

#### For Development:

7. Explain the structural differences of **atoms**, ions, and isotopes
8. Explain chemical **bonding** as a force which holds atoms or ions together in a molecule
9. Distinguish among **atoms, elements, molecules, and compounds**
10. Identify **chemical symbols** as one or two letters used to represent a particular element
11. Recognize the **chemical symbols** for common elements
12. Use the **Periodic Table** to identify atomic number, atomic mass, periods and families, metals and nonmetals
13. Explain the differences between **acids and bases**
14. Demonstrate how to safely handle acids, bases
15. **Activity:** Know how to test for **acidity/pH** (litmus paper or cabbage juice)
16. Identify common household liquids (vinegar, cleaning agents) as acidic or basic
17. Explain **neutralization** of acids and bases

**Resources:** [Atomic structure](#), [Matter](#), [Periodic Table1](#), [Periodic Table 2](#), [Element games](#), [Exploring Acids and Bases](#), [Ph scale 1](#), [Ph scale 2](#), [Miami Museum of Science](#), [Heat energy, Acids/Bases for ACS](#)

### Force, Motion and Work

#### For Review:

Mass; variables that affect moving objects; force as a push or pull on an object; types of forces (e.g., frictional, gravitational, electrical, centripetal,)

#### For Development:

18. List the causes of **friction**
19. **Activity:** Demonstrate ways to increase or decrease **frictional forces**
20. Demonstrate or illustrate each of **Newton's Three Laws of Motion**
21. Differentiate between **gravity, weight and mass**
22. Predict the effects of varying forces upon an object.
23. In simple terms, define **work** and how to measure it
24. Give an example of each type (six) of **simple machines** and how each makes work easier
25. **Activity:** construct a simple machine and demonstrate its use to do work.
26. Give examples of a **compound machine**
27. Predict the amount of work (in general terms) needed to move various objects various distances, and which simple machine would make the work easier.

**Resources:** [Motion 1](#), [Motion 2](#), [Simple machines 1](#), [Simple machines 2](#), [Simple machines 3](#), [Simple machines 4](#), [Friction](#)

### Energy

#### For Review:

**Renewable, non-renewable sources** of energy; **forms** of energy (thermal, light, sound, electrical, chemical and nuclear) kinetic energy, potential energy, relationship between potential and kinetic energy

#### For Development:

##### **Thermal (Heat) Energy**

28. Explain how heat energy can be transmitted by waves
29. Identify sources of heat energy
30. Identify heat **conductors** and **insulators**
31. Describe the processes of **heat transfer** (conduction, convection, and radiation)

**Resources:** [Energy Page](#), [Energy](#), [Alliant Energy for Kids](#), [Smart Energy Use for Kids](#), [\(NEED\) Project](#) (National Energy Education Development), [Heat Energy](#), [Energy projects](#), [Generators](#), [Conduction, Convection, & Radiation](#), [How hot is it?](#), [Heat transfer](#).

### **Magnetism and Electricity**

#### For Review:

Magnetic fields; static and current electricity; electromagnetism; conductors and insulators; open and a closed circuit; parallel circuit and series circuit

#### For Development:

32. Identify the units of electrical **measurement**
33. Describe the main parts of a **capacitor**
34. Explain how electricity is produced by generators and motors
35. Give an example of **A.C. (alternating)** and **D.C. (direct)** currents
36. Describe **Ohm's Law** and how it is applied

**Resources:** [Magnetism and Electricity](#), [Magnets and Metals](#), [Elec. Activities from ACS](#)

## Light and Sound (Wave Energy)

### Light and Color

37. Explain how an object is visible because of the **light** reflected from it
38. Identify the properties of light (direction, diffusion, speed, travels in a vacuum)
39. Discuss how light travels in waves
40. Identify components of the **electromagnetic spectrum** (invisible light, x-rays, ultra violet, etc)
41. Identify objects as **transparent, translucent, and opaque**
42. Explain **refraction** and **absorption** of light
43. Explain how **colors** are produced
44. Identify types of images formed by convex and concave mirrors/lenses

Resources: [Optical Research Associates](#), [light](#), [Electric current](#)

### Sound

#### For Review:

Properties of sound; producing sounds; decibels; loudness and pitch; ways of changing pitch

#### For Development:

45. Explain how **sound waves** are mechanical waves that need to move through a substance
46. Discuss how the **speed of sound** depends on the material through which it passes
47. **Activity:** demonstrate materials which **reflect and/or absorb sound**
48. Explain the connection between **frequency, wavelength, and amplitude**
49. Differentiate between **ultrasonic** and **subsonic**
50. Describe how **radar** and **sonar** work

Resources: [Sound 1](#), [Sound 2](#), [Sound waves 3](#), [More on sound](#), [Energy transfer/sound](#)

## Nuclear Energy

#### For Development:

51. Distinguish between **nuclear fission** and **nuclear fusion**
52. Explain **radioactivity**
53. Discuss the effects of **radiation** on living organisms
54. Describe the operation of a **nuclear reactor**
55. Identify societal issues related to the use of **nuclear energy**
56. Explain the **need for conserving** non-renewable sources of energy
57. Suggest **ways to conserve** energy
58. Explore ways to utilize **solar energy**
59. Describe ways in which energy is **converted** to other forms (**Law of Conservation of Energy**)
60. Examine and evaluates **societal decisions** regarding environmental issues (look for local examples)

Resource: [Nuclear Energy1](#), [Nuclear Energy 2](#), [Solar Energy](#), [Solar energy 2](#), [Nuclear Reactor](#), [Risk Analysis](#)

## Society and Technology

#### For Review:

Identify the steps used in scientific inquiry (hypothesis, experimentation, analysis, conclusion)

#### For Development:

61. Discuss how various factors ( geographic location, limited resources, political and /or social considerations) influence the use of technology
62. Read, construct, and interpret data in various forms (tables, graphs, maps, charts, diagrams, symbols, etc.)



63. Explain the difference between description (observation, summary) and explanation (inference, prediction, significance, importance)
64. Discuss how sample size and control affect scientific investigations
65. Discuss risk-benefit analysis

**Resources:** [Sample size](#), [Procedural points](#), [Data analysis and graphs](#)

### **Related Readings**

Articles on energy, environmental issues; biographies of chemists and physicists; nonfiction trade (picture) books on electricity, energy, force, etc.; cross-section books dealing with inventions

### **Informal Assessment**

Students “invent” a new element, with properties consistent with its place on the Periodic Chart; construct charts, diagrams, models of properties, work, heat transfer, etc.; construct operational models; create multimedia presentations for class; give demonstrations, draw a comic book explaining a concept for younger students.

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Teacher Materials:		Student Materials:	
<p align="center"><b>Grade 8 Science Objectives</b> <b>Archdiocese of Cincinnati</b></p>		<p><b>Instructional Objectives:</b></p>	
<p><b>Matter and change</b></p> <ol style="list-style-type: none"> <li>Identify <b>chemical reactions</b> in terms of reactants and products</li> <li>List factors affecting the <b>rate of reactions</b></li> <li>Measure the <b>volume</b> of various objects</li> <li>Compare <b>densities</b> of various substances</li> <li>Explain the relationship of <b>mass, volume, and density</b></li> <li>Explain effects of height, depth on <b>pressure</b></li> </ol> <p><b>Atomic Structure</b></p> <ol style="list-style-type: none"> <li>Explain differences <b>atoms</b>, ions, isotopes</li> <li>Explain chemical <b>bonding</b></li> <li>Distinguish among <b>atoms, elements, molecules, and compounds</b></li> <li>Identify <b>chemical symbol</b> of element</li> <li>Recognize chemical symbols for common elements</li> <li>Use the <b>Periodic Table</b></li> <li>Explain difference betw <b>acids and bases</b></li> <li>Demonstrate how to safely handle acids, bases</li> <li><b>Activity:</b> test for <b>acidity/pH</b></li> <li>Identify household liquids acidic, basic</li> <li>Explain <b>neutralization</b> of acids and bases</li> </ol> <p><b>Force, Motion and Work</b></p> <ol style="list-style-type: none"> <li>List the causes of <b>friction</b></li> <li>Activity: Demonstrate ways to increase or decrease <b>frictional forces</b></li> <li>Demonstrate <b>Newton's Laws of Motion</b></li> <li>Differentiate betw <b>gravity, weight, mass</b></li> <li>Predict effects of varying forces</li> <li>Define <b>work</b> and how to measure it</li> <li>Give an example of each type (six) of <b>simple machines</b></li> <li><b>Activity:</b> construct a simple machine</li> <li>Give examples of <b>compound machine</b></li> <li>Predict the amount of work needed to move various objects</li> </ol> <p><b>Energy: Thermal (Heat) Energy</b></p> <ol style="list-style-type: none"> <li>Explain how heat energy can be transmitted by waves</li> <li>Identify sources of heat energy</li> <li>Identify <b>conductors and insulators</b></li> <li>Describe the processes of <b>heat transfer</b> (conduction, convection, and radiation)</li> </ol> <p><b>Magnetism and Electricity</b></p> <ol style="list-style-type: none"> <li>Identify units of electrical <b>measure</b></li> <li>Describe the main parts of a <b>capacitor</b></li> <li>Explain how electricity is produced</li> <li>Give ex. of <b>A.C. and D.C. currents</b></li> <li>Describe <b>Ohm's Law</b> and its application</li> </ol>		<p><b>Wave Energy :Light and Color</b></p> <ol style="list-style-type: none"> <li>Know that an object is visible because of the <b>light</b> reflected from it</li> <li>Identify the properties of light</li> <li>Discuss light travels in waves</li> <li>Identify components of the <b>electromagnetic spectrum</b></li> <li>Identify objects as <b>transparent, translucent, and opaque</b></li> <li>Explain <b>refraction</b> and <b>absorption</b></li> <li>Explain how <b>colors</b> are produced</li> <li>Identify types of images formed by convex and concave mirrors/lenses</li> </ol> <p><b>Sound</b></p> <ol style="list-style-type: none"> <li>Explain how <b>sound waves</b> work</li> <li>Discuss what effects <b>speed of sound</b></li> <li><b>Activity:</b> demonstrate materials which <b>reflect and/or absorb sound</b></li> <li>Explain how <b>frequency, wavelength, and amplitude</b> connect</li> <li>Differentiate <b>ultrasonic, subsonic</b></li> <li>Describe how <b>radar</b> and <b>sonar</b> work</li> </ol> <p><b>Nuclear Energy</b></p> <ol style="list-style-type: none"> <li>Distinguish between <b>nuclear fission</b> and <b>nuclear fusion</b></li> <li>Explain <b>radioactivity</b></li> <li>Discuss the effects of <b>radiation</b></li> <li>Describe <b>nuclear reactor</b></li> <li>Identify societal issues related to the</li> <li>Explain the <b>need for conserving</b> non-renewable sources of energy</li> <li>Suggest <b>ways to conserve</b> energy</li> <li>Explore ways to utilize <b>solar energy</b></li> <li>Describe ways in which energy is <b>converted</b> to other forms (<b>Law of Conservation of Energy</b>)</li> <li>Examine and evaluates <b>societal decisions</b> regarding environmental issues</li> </ol> <p><b>Society and Technology</b></p> <ol style="list-style-type: none"> <li>Discuss how various influence the use of technology</li> <li>Read, construct, and interpret data in various forms</li> <li>Explain the difference between description and explanation</li> <li>Discuss how sample size and control affect scientific investigations</li> <li>Discuss risk-benefit analysis</li> </ol>	
		<p><b>Procedure:</b></p>	
		<p><b>Announcements:</b></p>	
Homework:		Evaluation:	

## **Appendix A: Safety Considerations**

Student safety is always a concern, but it is especially so when students deal with chemicals, sharp objects, or other equipment and materials that can injure them in any way. When performing science experiments and activities, be aware of the following safety concerns and protect your students from injuries.

For teachers:

- Warn students beforehand about using any harmful materials
- Know the appropriate manner of cleaning up after using any chemicals
- Store chemicals and sharp instruments away from students
- Make sure room is properly ventilated when using gaseous materials

For students:

- Wear goggles whenever working with materials that can splash, pop off, or fly up.
- Do not taste or smell substances unless directed to do so by teacher
- Handle sharp objects, chemicals, glass, and thermometers carefully
- Dispose of materials only as directed
- Clean up carefully
- Wash hands after experiments

Flinn Scientific Inc. publishes a free newsletter that highlights safety issues as well as teaching tips, product development, and professional opportunities.

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Web site: [www.flinnsci.com](http://www.flinnsci.com)

## Appendix B - Health

Traditionally, health and safety objectives have been taught as one quarter of the science program. Some schools opted to teach health one day a week; others taught it one quarter of the school year. In either case, the health and safety program required a significant amount of the time set aside for science.

While some health and safety issues are very much connected to science, many are not. In the Health and Physical Education Graded Course of Study, we recommend that health objectives that can be addressed in other curricular areas, particularly religion and physical education, be placed there.

Good science instruction requires students' involvement in hands-on activities, demonstrations, and experiments, spending time observing as well as researching and recording data, and interpreting it. As the body of scientific knowledge grows over the years, and as the importance of understanding science and technology grows in society, the amount of time needed to "do science" increases as well.

With this in mind, this graded course of study has incorporated grade-level health and safety objectives wherever possible and appropriate. Some objectives are not covered here, notably those dealing with sex education and with social and emotional health. These are primarily addressed in religious education family life/human development programs.

Because of the nature and amount of science required in grades 7 (earth science) and 8 (physical science), no health objectives are included in these grades.

The State of Ohio requires the teaching of health and safety, but allows for local determination of how and when these objectives are covered. Therefore, **health grades are still required in grades K-6 in the Archdiocese of Cincinnati**, but are not necessary in grades 7 and 8. K-6 science teachers will need to assign a grade in "health" at least once during the course of the school year. Health grades can also be assigned by religion and physical education teachers in light of the health and safety objectives they may cover. We recommend that **teachers note when health objectives are addressed and assign the health grade accordingly**. The one semester required study of health in grades 9-12 is still necessary for high school graduation.

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## Appendix C - Field Trips/Community Resources

### Dayton/Northern Area

#### **Conservation, Nature Study, Outdoor Ed.**

Check local city, county, state parks. Many offer programs as well as being available for field study.

[Aullwood Audubon Center and Farm](#), 1000 Aullwood Rd., Dayton, OH 45414; 937-890-3638.  
[Brukner Nature Center](#), 5995 Horseshoe Bend Rd., Troy, OH 45373; 937-698-6493.  
[Camp Joy](#), 10117 Old 3-C Hwy, Clarksville, OH; 1-800-300-7094.  
[Camp Kern](#) 5291 State Route 350, Oregonia, Ohio 45054 (near Fort Ancient).  
[Camp Willson](#) 2732 County Road 11, Bellefontaine, OH; 800-423-0427 OR 937-593-9001  
[Carillon Historical Park](#), 1000 Carillon Blvd., 45409, (937) 293-2841  
[Cox Arboretum](#) 6733 Springboro Pike, Dayton, 45449 - (937) 434-9005  
[Dayton Aviation Heritage National Historical Park](#) is located in and around Dayton, Ohio. The Wright Cycle Company Complex and Carillon Historical Park are located in Montgomery County. The Huffman Prairie Flying Field Interpretive Center and Huffman Prairie Flying Field are located in Greene County.  
[Five Rivers Metroparks](#) wide variety of free educational programs at various MetroParks locations  
[Learning Tree Farm](#), 3376 South Union Road, 45418; (937) 866-8650  
[National Museum of the United States Air Force](#), (Wright Patterson) Dayton  
[Neil Armstrong Air and Space Museum](#), Wapakoneta  
[Ohio Caverns](#), 2210 East Route 245, West Liberty, OH 43357, (937) 465-4017.  
[SunWatch Indian Village](#)/Archeological Park, 3201 W. River Rd., Dayton; 937-268-8199  
[Wright Brothers Aeroplane Company and Museum of Pioneer Aviation](#); West Milton, OH 45383

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### Cincinnati Area

#### **Astronomy**

[Cincinnati Observatory Center](#), 3489 Observatory Place, 45208 or Dean Regas, 321-5186;  
[Drake Planetarium](#), 2020 Sherman Ave., Cincinnati, OH 45212; 513-396-5578

#### **Conservation, Nature Study, Outdoor Ed.**

Check local city, county, state parks. Many offer programs as well as being available for field study.

[Butler County Dept. of Environmental Services](#), Division of Recycling and Litter Prevention, 130 High St., Hamilton, OH 45011; 513-887-3406  
[Camp Campbell Gard](#), Great Miami Valley YMCA, P.O. Box 122 Overpeck, OH 45055 (Hamilton area) 513-867-0600  
[Cincinnati City Parks](#) include Avon Woods Nature Center, Paddock Rd., 513-861-3435  
[Cincinnati Nature Center](#)/Longbranch Farm/Gorman Farm/Rowe Woods, 4949 Tealtown Rd., Milford, OH 45150; 513-831-1711.  
[Cincinnati Zoo and Botanical Gardens](#) /Center for Reproduction of Endangered Wildlife (CREW), 3400 Vine St., 45220; 513-559-7737  
[Governor Bebb Preserve and Pioneer Village](#), 2051 Timberman Rd. Hamilton, OH 45013; (513) 867-5835

[Gorman Heritage Farm](#), 3035 Gorman Heritage Farm Lane, off Reading Rd. Evendale  
[Green Acres Nature Center](#), 8255 Spooky Hollow Rd., Indian Hill 45242 513-891-4227  
[Hamilton County Department of Environmental Services](#) recycling; air quality programs  
Spencer's Team News - great listing of inservices, free materials, tours, etc. for environmental science.  
[Hamilton County Parks](#), 521-3276; Parky's Farm, Sharon Woods, Shawnee Lookout, Farbach Werner, etc.  
Check [Evergreen](#) for current events.  
[Imago](#), 700 Enright Ave., 45205; 513-921-8455  
[Hummel Heritage Farm](#) or [Chris Ferguson](#), near Lawrenceburg, IN 513-821-2011  
[Rumpke Landfill](#), Colerain Township. Free tours. 513-741-2637  
[Woodland Altars Outdoor Education Center](#), 33200 State Route 41, Peebles, Ohio 45660, 1-800-213-1161 or (937) 588-4411

## **Museums**

[Cincinnati Museum Center](#) (Union Terminal), 1301 Western Ave., 45203; 513-287-7000.  
Museum of Natural History and Science; Children's Museum; Cincinnati History Museum; Omnimax Theater  
[Newport Aquarium](#), 1 Aquarium Way, Newport, KY; 859-491-3467.

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## Appendix D - Correlation with the State

### **Correlations with Ohio State Science Benchmarks**

As chartered non-public schools, Archdiocesan schools have the right to follow their own Graded Courses of Study, which are based on national standards. Ohio state **standards** are covered, and **benchmarks** are also taken into account, though not adopted completely at every grade. Correlations between the Archdiocesan GCS and Ohio content standard **benchmarks** are listed below. Students educated in archdiocesan schools cover the content of the public standards, and include health, safety and environmental education. State standards are written for **Earth and Space, Life, Physical sciences, Science and Technology, Scientific Inquiry, and Science Ways of knowing**. Ohio benchmarks are written for grades K-2, 3-5, 6-8, 9-10, and 11-12.

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## Correlations with Ohio State Science Benchmarks, Grade K-2

Archdiocesan <b>PreK</b> Science objectives	Related to Ohio Science Benchmarks for grades K-2	Archdiocesan <b>K</b> Science objectives	Related to Ohio Science Benchmarks for grades K-2	Archdiocesan <b>Gr 1</b> Science objectives	Related to Ohio Science Benchmarks for grades K-2	Archdiocesan <b>Gr 2</b> Science objectives	Related to Ohio Science Benchmarks for grades K-2 (denotes grades 3-5 standards)
1-3	Earth D	1-3	Earth D	1-4	Life C	1-3	Earth D
4	Life A	4	Life A	5	Life B,C	4-11	Life B
5-6	Life B	5-6	Life C	6-8	Life B	11	SciWays B
7	Life C	7-8	Life B	8a	Inquiry C	12-26	N/A (Health)
8-13	N/A (Health)	9-29	N/A (Health)	8b	Inquiry B	27	Phys A
14-16	Earth A	21-22	Earth C	8c	Inquiry C	28-31	Phys B
17	N/A (Safety)	23	Earth A	8d	SciWays A	32	Inquiry A,B,C
18	SciTech A	24	Earth C	9-15	Life B	33	Phys B
19-20	Inquiry B	25-26	Phys A	16	Life C	34	Phys B; Ways A
21	SciTech B	27	Inquiry A	17-25	N/A (Health)	35	Phys B
		28	Inquiry C	26-30	Earth C	36	Phys B Inquiry C
		29	SciTech A	31	N/A (Safety)	37	Phys B Inquiry C
				32	Phys A	38	Inquiry B,C
				33-35	Phys B,C	39	(Phys D)
				36	Inquiry C	40	(Phys A)
				37	Inquiry A	41	(Phys D)
						42-43	(Phys C)
						44-45	Inquiry A
						46	Inquiry C
						47-48	SciTech A

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## Correlations with Ohio State Science Benchmarks, Grade 3-5

Archdiocesan <b>Gr. 3</b> Science objectives	Related to Ohio Science Benchmarks for grades 3-5	Archdiocesan <b>Gr. 4</b> Science objectives	Related to Ohio Science Bench-marks for grades 3-5	Archdiocesan <b>Gr. 5</b> Science objectives	Related to Ohio Science Bench-marks for grades 3-5
1-5	Earth C; Phys D, E	1-5	Earth C	1-5	Earth C
6-8	Life A	6-10	Life A, B, C	6-8	Life A
9-16	N/A (Health and Safety)	11-27	N/A (Health and Safety)	9	Life B
17-24	Earth A	28-33	Phys C	10-16	N/A (Health)
25-33	Earth B	34	SciTech A	17-22	Earth D
34-36	Earth D	35-36	SciTech A	23-32	Earth A
37, 38,40	Phys B	37	Inquiry C	33-36	Phys E
39,41,42	Phys A	38	Inquiry A	37-39	Phys A(6-8)
43-45	Phys B	39	SciTech B	40-50	Phys E
46	SciTech B	40	Inquiry B	51-52	SciTech A
47-48	Inquiry A	41	Ways C	53-55	SciTech B
49	Inquiry B	42	Ways B	56	Inquiry B
50	Inquiry A			57	Ways A

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## Correlations with Ohio State Science Benchmarks, Grade 6-8

Archdiocesan <b>Gr. 6</b> Science objectives	Related to Ohio Science Benchmarks for grades 6-8	Archdiocesan <b>Gr. 7</b> Science objectives	Related to Ohio Science Benchmarks for grades 6-8 and for (gr. 9- 10)	Archdiocesan <b>Gr. 8</b> Science objectives	Related to Ohio Science Bench-marks for grades 6-8 for (gr. 9-10)
1-3	Life D	1-2	SciTech A	1-6	Phys A
4-8	Life B	3-6	Life C	7-17	(Phys A, B)
9-12	N/A (Classification)	7	(Earth F)	18-27	Phys B
13-18	Life A	8	Earth C	28-31	Phys D(E,F,G)
19-24	Life B	9-10	Earth B	32-36	Phys D
25-26	Life C	11-12	(Earth F)	37-50	(Phys G)
27-33	Life B	13-25	Earth A, C, E	51–60	Phys C
34-38	N/A (Health)	26	(Earth C)	61	SciTech A
39-42	SciTech A	27-29	Earth E	62	Inquiry B
43	Inquiry A	30-34	Earth D	63	Ways A
44	Inquiry B	35-40	Earth E	64	Inquiry A
45	Ways A	41-48	(Life F)	65	SciTech B
		49-51	(Life G)		
		52	SciTech A,B		
		53-54	Inquiry A		
		55	Inquiry B		
		56	Ways B		

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## Appendix E - Overview with Time Frames

### Overview of Science Graded Course of Study With Suggested Time Frames

Grade	No. of Objectives	Environmental Focus	Life Focus	Content with <b>Suggested Time Frames</b>
Pre-K, K	PK - 21 K-29	Litter; water	No specific focus	Living/non-living; body parts; sun, shadows; night/day; weather
Grade 1	35	Litter	Birds	Seeds/plants; habitats; seasons; push/pull
Grade 2	48	Recycling, reusing	Insects	Eye, ear, teeth health; animal families; sound; force and motion
Grade 3	52	Natural resources, energy	Reptiles	Medicines; earth, sun, moon; soil and rocks; physical, chemical properties and changes
Grade 4	42 (plus ecosystems)	Water conservation	Plants	Ecosystems, environ focus; technology - <b>2 Quarters</b> Health/foods - <b>1 Quarter</b> simple machines - <b>1 Quarter</b>
Grade 5	56	Air quality	Amphibians	Health/Drug ed - <b>1 Quarter</b> Air, weather, sound, amphibians - <b>1 Quarter</b> Atoms, electricity - <b>1 Quarter</b> Solar system; technology- <b>1 Quarter</b>
Grade 6	47(plus body systems)	Endangered species	Mammals	Plants; mammals; environmental focus - <b>1 Quarter</b> Origin of life; cells; Classification - <b>1 Quarter</b> Genetics; technology - <b>1 Quarter</b> Body systems; first aid - <b>1 Quarter</b>
Grade 7	56	Land use; air, water pollution	Fish	Meteorology, environ focus - <b>1 Quarter</b> Geology, environ focus - <b>1 Quarter</b> Oceanography; life focus- <b>1 Quarter</b> Astronomy; technology - <b>1 Quarter</b>
Grade 8	65	Energy resources	None	Matter and change; atomic structure - <b>1 Quarter</b> Energy - <b>2 Quarters</b> Force, motion, technology - <b>1 Quarter</b>